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Indian Standard

SPECIFICATION FOR INSULATING MATERIALS BASED ON BUILT-UP MICA OR TREATED MICA PAPER

PART III SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 3 Flexible Mica Flake Tape for Insulation of Electrical Machines

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(*Continued on page* 2)

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SPECIFICATION FOR INSULATING MATERIALS BASED ON BUILT-UP MICA OR TREATED MICA PAPER

PART III SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 3 Flexible Mica Flake Tape for Insulation of Electrical Machines

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 October 1982, after the draft finalized by the Solid Electrical Insulating Materials Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard deals with built-up mica or treated mica paper for use in electrical equipment. It consists of the following three parts:

Part I Definitions and general requirements,

Part II Methods of test, and

Part III Specifications for individual materials.

0.3 This standard (Part III/Section 3) covers the requirements for flexible mica flake tapes for insulation of electrical machines.

0.4 This standard should be read in conjunction with IS : 9299 (Part I)-1979* and IS : 9299 (Part II)-1979†.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Specification for insulating materials based on built-up mica or treated mica paper:
*Part I Definitions and general requirements.
†Part II Methods of tests.
‡Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard (Part III/Section 3) covers various types of flexible mica flake based tapes for use as insulation in electrical machines.

1.2 The tapes covered by this standard may have muscovite or phlogopite mica flake as base material and a backing of paper, polyester film or woven glass fabric on one or both sides depending on tensile strength requirement.

2. CONSTRUCTION

2.1 The base and backing materials shall be bonded together with a suitable resinous binder depending upon the dielectric and other electrical properties required by the user.

2.2 The thickness of the tape shall be as given in Table 1 for various types of tapes.

3. GENERAL REQUIREMENTS

3.1 The tapes, as supplied, shall be of uniform texture free from foreign impurities, through holes and gaps between the mica splittings.

3.2 The tapes shall be of uniform width and thickness with neatly trimmed edges and without delaminations. The surface shall not be tacky unless required by the users.

3.3 The reel or roll shall be capable of being unrolled without damage. The force required to unroll the tape shall be substantially uniform. Where interleaving is necessary or required by the purchaser, it shall normally consist of film or paper and shall not transfer deleterious substance to the material. The material shall be rolled with the mica surface on the outside.

3.4 The bonding medium used shall be as agreed to between the supplier and the purchaser. The material when tested in accordance with the methods given in IS : 9299 (Part II)-1979* shall comply with all the requirements of the standard.

4. TESTS

4.1 Type Tests — The following tests shall constitute type tests:

a) Thickness,

b) Dimensions,

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*Specification for insulating materials based on built-up mica or treated mica paper: Part II Methods of test.

TABLE 1 THICKNESS OF TAPES

(*Clause* 2.2)

SL No.	MICA	TYPICAL BINDER	TYPICAL BACKING MATETIALS	SIDES	NOMINAL THICKNESS IN mm
(1)	(2)	(3)	(4)	(5)	(6)
1.	Phlogopite	Bitumen varnish	Tissue/kraft paper	One side	10·08
			Glass fibre and tissue/kraft paper	two sides	0·10, 0·13 and 0·17
		Alkyd varnish	Glass fibre and tissue/kraft paper	two sides	0·10, 0·13, 0·15, 0·17 and 0·21
		Silicone varnish	Glass fibre	one side	0·08, 0·10, 0·13 and 0·15
				two sides	0·10, 0·13, 0·15, 0·17 and 0·21
2.	Muscovite	Bitumen varnish	tissue/kraft paper	two sides	0·13, 0·15, 0·17 and 0·23
			Glass fibre and tissue/kraft paper		
		Alkyd varnish	Tissue/kraft paper	two sides	
			Glass fibre tissue/kraft paper		0·15, 0·17 and 0·21
		Silicone varnish/rubber	Glass fibre	two sides	0·10, 0·13, 0·15, 0·17, 0·21 and 0·23
		Isophthalate	Glass fibre PETP film	two sides	0·13 and 0·15
		Silicone	Glass fibre	ons side	0·08, 0·10, 0·13 and 0·15
				two sides	0·10, 0·13, 0·15, 0·17, 0·21 and 0·23

NOTE — On purchaser's request bitumen and alkyd bonded tape may be air dried.

c) Mica content,
d) Flexibility in cold state,
e) Transverse electric strength,
f) Tensile breaking strength and elongation at break, and
g) Detection of faults and conducting particles.

4.2 Routine Tests — The tests given in **4.1** shall also constitute the routine tests.

4.3 Thickness

4.3.1 The thickness of tapes as received shall be measured in accordance with **2** of IS : 9299 (Part II)-1979*.

4.3.2 The tolerances on tape thickness related to the nominal thickness are given in Table 2.

TABLE 2 TOLERANCES ON THICKNESS

All dimensions in millimetres.

NOMINAL THICKNESS	TOLERANCE LIMITS	
	Average for any Specimen	At Individual Points
(1)	(2)	(3)
0·08 0·10	± 0·02	+ 0·05 − 0·03
0·13	+ 0·02 − 0·03	± 0·05
0·15 0·17	+ 0·03 − 0·02	± 0·05
0·21 0·23	+ 0·04 − 0·03	± 0·06

4.3.3 The thickness of the mica tape shall be measured accurate to 0·01 mm by a bench mounted micrometer with a least count of 0·01 mm at ten points selected at random and spaced at approximately equal intervals along the length of the specimen.

4.4 Dimensions

4.4.1 The tolerance on the width of tapes of all sizes shall be ± 0·50 mm.

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*Specification for insulating materials based on built-up mica or treated mica paper: Part II Methods of test.

4.4.2 The length of each piece in a roll shall be not less than 5 m. Each roll shall not contain more than 3 pieces.

4.5 Composition of the Material

4.5.1 The content of mica, binder, etc, in mica tape shall be as given in Table 3 and shall be determined according to the method given in **3** of IS : 9299 (Part II)-1979*.

TABLE 3 COMPOSITION OF MATERIAL

Sl No.	Type of Tape	Nominal Thickness in mm	Contents in Percentage		
			Mica	Binder	Volatile Matter
(1)	(2)	(3)	(4)	(5)	(6)
1.	Alkyd bonded tape	Up to and including 0·15	45-50	15-30	3 *Max*
		over 0·15	40-45		
2.	Bitumen bonded tape	Up to and including 0·17	55 *Min*	15-30	3 *Max*
		over 0·17	50-55		
3.	Silicon bonded tape	Up to and including 0·15	45-50	15-30	1 *Max*
		over 0·15	40-45		
4.	Isophthalate bonded tape	Up to and including 0·13	45-60	20-30	1 *Max*
		over 0·13	40-45		

4.6 Flexibility in Cold State

4.6.1 The mica tapes shall be flexible in cold state.

4.6.2 To determine the flexibility of the mica tape a sample of width equalling to that of roll shall be taken. The length of the specimen shall be not less than two circumferences of the test mandrel whose diameter is 50 times the thickness of the mica tape. Keep the sample for 4 hours at a temperature of 27 ± 1°C and at a relative humidity of 65 ± 5 percent and then wrap one layer around the test mandrel. The mica tape with one side backing shall be wrapped with the mica layer contacting the mandrel.

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*Specification for insulating materials based on built-up mica or treated mica paper: Part II Methods of test.

4.6.3 The mica shall bend freely without separation of layers.

NOTE — The mica tape of all types shall retain its flexibility in cold state for a minimum period of 6 months from the date of manufacture or for a period mutually agreed between the supplier and the purchaser.

4.7 Transverse Electric Strength

4.7.1 The average of the electrical breakdown strength of the mica tape for 5 samples shall not be less than the values specified in Table 4. The minimum value out of the 5 readings obtained shall not be less than 75 percent of the value given in Table 4.

TABLE 4 ELECTRIC STRENGTH

SL No.	TYPE OF TAPE	NOMINAL THICKNESS IN mm	ELECTRIC STRENGTH (AVERAGE) kV/mm
(1)	(2)	(3)	(4)
1.	Alkyd bonded mica tape	0·10	14
		0·13 and 0·15	13
		0·17	11
		0·21	9
2.	Silicon bonded mica tape	0·08 and 0·10	13
		0·13 and 0·15	11
		0·17	10
		0·21 and 0·23	9
3.	Bitumen bonded mica tape	0·08, 0·10 and 0·13	19
		0·15 and 0·17	16
		0·23	14
4.	Isophthalate bonded mica tape	0·13	21
		0·15	14

4.7.2 The tests shall be carried out according to IS : 2584-1963*. The breakdown test with rapidly applied voltage shall be used as described in **7.1** of IS : 2584-1963*.

4.8 Tensile Breaking Strength and Elongation at Break

4.8.1 The test shall be carried out according to IS : 9299 (Part II)-1972†. The breaking load of the mica tape shall be as specified in Table 5.

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*Method of test for electric strength of solid insulating materials at power frequencies.

†Specification for insulating materials based on built-up mica or treated mica paper: Part II Methods of test.

TABLE 5 BREAKING LOAD OF MICA TAPE

(*Clause* 4.8.1)

Sl No.	Type of Backing	Tensile Strength N/cm Width (*Min*)
(1)	(2)	(3)
1.	Tissue/kraft paper	20·0
2.	Tissue kraft paper and glass	40·0
3.	Both sides glass	180·0
4.	One side glass and PETP film on the other side	130·0

Note — Elongation requirement is under consideration.

4.9 Detection of Faults and Conducting Particles

4.9.1 The mica tape shall be free from foreign inclusion, penetrating holes and gaps between the mica flakes. The mica flakes shall not scale off the one-side backed tape. The total area of individual blister's under the layer of paper, fibre glass, etc, shall not exceed 15 percent of the area of the specimen under test. There shall be no wrinkles on backing which bring the mica tape beyond the tolerance limits for the requirement of thickness at individual points.

4.9.2 Apply an alternative voltage of 2 kV 50 Hz on the sample, by passing the sample at a speed of 3 m/minute between two rollers of 80 mm diameter. In the event of detection of particles or electrical breakdown, the defect is eliminated by punching it out in circles of 10 mm diameter around the defect.

5. SUPPLY AND PACKING CONDITIONS

5.1 The tapes shall be supplied in lengths of 5 m or 50 m or as agreed between the purchaser and the supplier, and shall have a width of 20 or 25 mm. The tapes may also be supplied in any other width mutually agreed to between the buyer and the supplier.

5.2 The mica tape in rolls shall be packed in airtight metal cans of tin plated steel, placed in solid wooden boxes or crates or any other type of packing ensuring airtightness, preservation of shape and protection against mechanical damage of tape in rolls.

6. MARKING

6.1 Each roll shall be marked with the following information:

a) Name of the manufacturer;
b) Type of mica used in tape;
c) Length, width and thickness of mica tape;
d) Weight of mica tape;
e) Batch number, year and month of manufacturing;
f) Type of bonding agent and the name of the solvent; and
g) Shelf life of the mica tape.

6.2 The mica tape may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors may be obtained from the Indian Standards Institution.

7. SAMPLING

7.1 Sampling shall be as agreed between the supplier and the purchaser.

AMENDMENT NO. 1 APRIL 1985

TO

IS : 9299 (Part III/Sec 3) - 1982 SPECIFICATION FOR INSULATING MATERIALS BASED ON BUILT-UP MICA OR TREATED MICA PAPER

PART III SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 3 Flexible Mica Flake Tape for Insulation of Electrical Machines

(*Page* 9, *Table* 5) — Substitute the following for the existing table:

TABLE 5 BREAKING-LOAD OF MICA TAPE

(*Clause* 4.8.1)

SL No.	TYPE OF BREAKING	TENSILE STRENGTH N/cm WIDTH (*Min*)
(1)	(2)	(3)
i)	Tissue/kraft paper	20·0
ii)	Tissue/kraft paper and glass	90·0
iii)	Single side glass covering	80·0
iv)	Both sides glass	180·0
v)	One side glass and PETP film on the other side	130·0

NOTE — Elongation requirement is under consideration.

(ETDC 63)

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